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APPLICATION FOR UNITED STATES LETTERS PATENT

SPECIFICATION

TO ALL WHOM IT MAY CONCERN:

Be it known that We, **Wilhelm Fischbach**, a citizen of Germany, residing at Wehrstraße 8, D-78652 Deißlingen-Laufen, Germany; and **Robert Knöpfle**, a citizen of Germany, residing at Täleweg 28, D-72275 Alpirsbach-Peterzell, Germany have invented a new and useful **METHODS AND APPARATUS TO LOCK A DUST COVER IN A FIREARM HOUSING**, of which the following is a specification.

METHODS AND APPARATUS TO LOCK A DUST COVER IN A FIREARM HOUSING

RELATED APPLICATION

[0001] This patent issues from a continuing application which claims priority from International Patent Application Serial No. PCT/EP03/00674 which was filed on April 10, 2002, which is hereby incorporated by reference in its entirety.

FIELD OF THE DISCLOSURE

[0002] This disclosure relates generally to firearm housings, and, more particularly, to methods and apparatus to lock a dust cover in a firearm housing.

BACKGROUND

[0003] In the following disclosure, positional terms such as “above” and “below” are used with reference to a gun in its normal firing position, that is, positioned to shoot “forward” (away from the shooter) in a generally horizontal plane.

[0004] Dust covers for hand-held firearms have long been known in the art, especially from their use with handguns that have a housing. Example uses include covering the magazine opening, (e.g., the automatic pistol MAS Mod. 1938) or the ejection opening (e.g., the combat rifle 44) of the firearm. In the case of a magazine dust cover, the dust cover employs a mechanical locking device such as a simple catch piece that may be opened and closed by

hand. In the case of an ejection opening dust cover, the action of a spring causes the dust cover to open automatically when the moving breechblock opens the mechanical locking device. When not firing or when handling the gun, the ejection door may be closed by hand.

[0005] In traditional guns, the housing is made of steel or sheet metal that is sufficiently rigid to ensure a faultless operation of the locking device, even if the housing is constantly stressed by the spring when the dust cover is in the closed position.

[0006] Modern guns, however, often employ a plastic housing in which an expanded metal insert is added proximate to the locking device so that the locking device will seat properly. With improvements in design and construction, plastic housings have become more and more lightweight and, accordingly, more and more flexible. As a result, a housing of this type becomes temporarily deformed in a noticeable manner if, for example, the gun falls on the ground or strikes a solid obstacle with sufficient force. This deformation can cause the locking device to disengage in an undesired manner, so that the aforementioned cover opens just when the danger of foreign object entry is especially great. For example, dirt may enter the uncovered opening if the gun were to impact with a hard surface, such as a floor.

[0007] In housings with two ejection openings (for right-handed or left-handed marksmen), the opening that is not in use should remain closed in order to prevent possible damage that could otherwise result from, for example, sand or dust entering the gun. Moreover, as a general rule during

operation, the marksman checks the used ejection opening only, and does not check the unused one.

[0008] To improve operation, expanded reinforcements could be embedded around the ejection opening and into the dust covers. However, these measures would be counter-productive because they would cause an increase in the weight of the housing. Another option would be to redesign the locking device so that it supports larger tolerances. This would mean, however, an increase in the cost of the firearm. Also, the required space is often not available.

BRIEF DESCRIPTION OF THE DRAWINGS

[0009] FIG. 1 is a schematic illustration of the truncated, rear part of an example semi-automatic rifle that is constructed in the so-called Bullpup configuration.

DETAILED DESCRIPTION

[0010] FIG. 1 is a schematic illustration of the truncated, rear part of an example semi-automatic rifle that is constructed in the so-called Bullpup configuration. In this example, the rifle has a housing 1 that surrounds the breechblock and its motion path (not shown in the figure). The housing 1 ends directly behind the aforementioned motion path. A floor plate 3 sits on the rear side of the housing 1 and, thus, directly borders the rear end of the motion path of the breechblock. Thus, to a certain extent, the rear stock that is traditional in sporting rifles has been left out of the figure. A magazine 5 is

arranged on the underside of the housing 1 near the floor plate 3. The handle piece (not shown in the figure) is located in front of the magazine 5.

[0011] A first dust cover 7 is visible above the magazine 5. This dust cover 7 is activated for left-handed marksmen. A second dust cover for right-handed marksmen is arranged on the opposite side (not shown) of the housing 1 and is a mirror image of the first dust cover 7.

[0012] The dust cover 7 covers an ejection opening 17. This opening is partially visible in the figure because the dust cover 7 is shown in a partially cutaway view. The dust cover 7 is generally rectangular. An axle 11 extends beneath and parallel to the underside edge of the opening 17. The underside of the dust cover 7 is pivotably mounted to the axle 11. The free upper edge 9 of the dust cover 7 extends approximately parallel to the underside edge of the cover 7.

[0013] In the illustrated example, a continuous, multiply crimped, and highly ferromagnetic steel sheet metal strip 13 is inserted into the side of the dust cover 7 that faces the housing. The strip 13 is oriented parallel to the upper edge 9 of the dust cover 7. Because of its crimping, the strip either emerges from the dust cover 7 or lies close to the surface of the dust cover 7 at a minimum of three points. One of these points is located approximately in the middle of the upper edge 9. Another of these points is near the front edge of the dust cover 7. The last point is near the rear edge of the dust cover 7. In the illustrated example, the strip 13 is manufactured together with the dust cover 7 in a composite casting. The free parts of the strip 13 are treated on the surface (e.g., bonded, phosphatized, or the like) in order to prevent rusting.

[0014] Proximate to each point of the strip 13 that emerges or lies close to the surface of the dust cover, a magnetic pin 15 is inserted into the wall of the housing 1 above the ejection opening 17. The magnetic pins 15 may be flush with a facing surface of the housing 1, or may even project slightly above the embedded plastic of the housing 1. Magnetic pins 15 and strip 13 are constructed and arranged so that they lie flat against each other when the dust cover 7 is closed.

[0015] An inner contour of the opening 17 is constructed to complement the outer contour of the dust cover 7 (taking into account tolerances). Opposite this inner contour, however, the actual opening is made as a shoulder in the housing wall at least in the area of the magnet pins 15, so that the closed dust cover 7 sits on this shoulder, but, in addition, borders flush with the outer surface of the housing 1 (except for the area of the axle 11). Thus, interfering edges, which could lead to untimely detachment of the magnetic lock, are avoided. An application of force from the outside, which could cause an untimely opening of the dust cover 7, is also prevented.

[0016] From the preceding description, one possessing ordinary skill in the art will appreciate the advantages of the illustrated device. For example, a magnetic lock employing a metal strip 13 and magnetic pins 15 as the locking mechanism is simple, cost-effective, and achieves reliable locking of the dust cover or covers 7 on a hand-held firearm or handgun, even if the housing 1 becomes deformed as a result of an applied force, e.g., as a result of dropping the weapon.

[0017] Magnetic locks have long been known for use in furniture and appliances, such as refrigerators. However, these magnetic locks are considered to be low-quality, whereas high-quality furniture typically employs mechanical locks. The magnetic locks in refrigerators function primarily for the purpose of ensuring that children who become trapped in the refrigerator can free themselves by simply pushing on the door, which would often not be possible if a mechanical lock had been engaged. As a result of this history, the stigma of a lesser locking function is still associated with the magnetic lock.

[0018] However, a magnetic lock is far superior to a mechanical lock under certain conditions in a handgun, such as, if the parts held together do not consist entirely of ferromagnetic material. Specifically, if the breechblock of the gun consists mostly of ferromagnetic material and is moved closely past the disclosed magnetic lock, the magnetic holding force of the lock will not significantly impede the breechblock movement because the lock is embedded on all sides in plastic. Furthermore, a magnetic lock can be constructed in such a way that it acts over a long distance, thus preventing a possibly existent magnetic field of the breechblock from simultaneously affecting the entire magnetic lock. If the illustrated magnetic lock is accidentally disengaged (e.g., if the housing 1 is temporarily deformed), it will also shut itself again. For example, if an edge 9 of the dust cover 7 moves outwardly due to a deformation of the housing 1, the edge 9 is pulled shut again after the deformation is removed. Thus, the projecting edge 9 will not cause the lock to disengage.

[0019] The dust cover 7 can cover more than one opening. For example, the dust cover 7 may cover the magazine opening and/or another opening (such as one provided for the storage of a cleaning tool or the like) in the gun. Preferably, however, the dust cover 7 is located to cover an ejection opening 17 for cartridge shells, and the recoil movement of the breechblock opens the magnetic lock securing the dust cover 7.

[0020] It would be possible to construct the dust cover 7 out of sheet metal and to embed one or more magnets into the opposing housing 1. However, it is disadvantageous to manufacture a sheet metal cover of this type because it is more costly than a plastic cover, as the latter does not require any finishing work. Moreover, a sheet metal cover is considerably heavier than a plastic cover. Therefore, the illustrated example magnetic lock has at least one strip 13 made of ferromagnetic material inserted into the dust cover 7 near its free edge 9. Opposite the strip 13, at least one magnetic pin 15 is inserted into the housing 1 of the gun, whereby the longitudinal axis of the pin 15 extends perpendicularly or approximately perpendicularly to the strip 13.

[0021] The strip 13 is made of ferromagnetic material – usually steel sheet metal – and, thus, reinforces the dust cover 7 (which is made of plastic) to a significant extent. Thus, a lightweight construction is achieved, which, moreover, is quite rigid in the areas that are subject to the magnetic effect. The stability of the dust cover 7 is, therefore, ensured, which results in good action of the magnetic lock.

[0022] If the ferromagnetic strip 13 is viewed as a plane, then the axis of the pin-shaped magnets and/or magnetic pins 15 extends in a generally

perpendicular manner relative to the strip 13. A magnetic pin 15 is quite lightweight and acts as a local reinforcement of the housing 1. Also, it is possible to manufacture extremely powerful magnets in the form of relatively small pins using sintering technology. Thus, the magnetic pins 15 may be injected, adhered or welded into the housing 1. The embedding of the magnetic pin 15 by at least its width into the plastic housing 1 protects its sintered compact from breaking into pieces due to forceful impacts or the like. Even if broken, the embedded pieces will remain at the desired site and position in the housing 1 and, thus, retain their magnetic effect.

[0023] In experiments it has proven advantageous to allocate at least three magnetic pins 15 to the dust cover or each dust cover 7. A strip 13 made of ferromagnetic material is inserted into the dust cover 7 opposite each magnetic pin 15.

[0024] To illustrate an example firearm, consider a rather large caliber cartridge, such as a long shotgun cartridge of the caliber 12, which corresponds to an example dust cover 7 that can be approximately 90 mm long and approximately 25 mm high. This dust cover 7 may be made (aside from the strip or strips 13 inserted into the dust cover) entirely out of plastic. The three magnetic pins 15 act as a reinforcement of the upper edge of the ejection opening 17. In the area of the ejection opening 17, the plastic housing 1 may be designed so that it is at times double-walled. In such a case, the magnetic pins 15 are preferably embedded solidly in both wall layers.

[0025] It can be advantageous to have adjacent magnetic pins 15 oriented so that alternating, opposite poles point to the outside of the housing

1, or that all magnetic pins 15 point to the outside with the same pole. The preferred arrangement depends on whether a single sheet metal strip 13 is inserted in the upper edge of the dust cover 9 which opens to the bottom, or whether a different steel sheet metal strip 13 is allocated to each magnet.

[0026] Although certain example methods and apparatus have been described herein, the scope of coverage of this patent is not limited thereto. On the contrary, this patent covers all methods and apparatus fairly falling within the scope of the appended claims either literally or under the doctrine of equivalents.